We claim:

1. A method for processing a request from a first communications device for a virtual circuit through a network, said network having a plurality of nodes and links, each of said nodes having a plurality of output ports sharing a buffer having a buffer size, B, and each of said links being characterized by a bandwidth capacity, C, said method comprising the steps of:

provisioning a portion, B_i, of said buffer to each of said output ports, i, for use in a computation of effective bandwidth;

receiving a signal representing a request for admission of a virtual circuit in said network for conveying data from said first communications device to a second communication device, the requested virtual circuit to be routed through an access regulator and at least one node connected to a corresponding link of said network, wherein data transmission characteristics of said access regulator are represented by a set of parameters;

determining said effective bandwidth and buffer space requirements from said set of parameters, wherein a ratio of said effective buffer space requirement b_0 to said allocated buffer size B_i is substantially equal to a ratio of said effective bandwidth requirement to said link bandwidth capacity C; and

admitting said virtual circuit request if said determined bandwidth and buffer space requirements are less than available buffer memory space in said buffer and available link bandwidth capacity in said link.

2. The method of claim 1, wherein said set of parameters representing said transmission characteristics of said access regulator comprise a long term average rate, r, a maximum burst size, B_T, and a peak rate, P, and wherein a lossless effective bandwidth requirement e_0 satisfies the expression:

$$e_0 = \frac{P}{1 + \frac{B_i}{C}\frac{(P-r)}{B_T}}$$

3. The method of claim 1, wherein a lossy effective bandwidth, e_l, is obtained from the expression C/K_{max}, where K_{max} is the maximum value of K that satisfies the inequality:

$$P_r\left[\sum_i^K U_i(t) \geq C\right] \leq CLR.$$

4. The method of claim 1, wherein said portion, B_i, of said buffer is allocated to each of said output ports, i, by selecting a value from a range bounded by a lower limit that divides the buffer space, B, among all the ports such that $\sum_i B_i = B_{SMF}$ and an upper limit that allocates said portion, B_i, of said buffer to each of said output ports, i, using a sharing approach where each port uses B in their computation of effective bandwidths.

5. The method of claim 1, wherein a new connection request demanding a buffer size of $b_{l_{new}}$ is admitted if:

$$\sum_j^{J_i} \sum_k^{K_{i,j}} b_{l_{i,j,k}} + b_{l_{new}}$$
$$\leq \min\left\{ C_i\left(B - \sum_i^N \sum_j^{J_i} \sum_k^{K_{i,j}} b_{l_{i,j,k}} - b_{l_{new}} \right), B_i \right\}$$

6. The method of claim 1, wherein said access regulator is a leaky bucket regulator.

7. The method of claim 1, further comprising the step of allocating said effective bandwidth requirement in said link for said admitted virtual circuit.

8. The method of claim 7, wherein a set of n admitted virtual circuits, having respective bandwidth requirements e_n are already routed through said node and wherein the step of admitting comprises the step of:

routing an n+1th requested virtual circuit through said node with respective associated bandwidth requirement e_{n+1} if:

$$\sum_{j=1}^{n+1} e_j \leq C$$

9. The method of claim 1, further comprising the step of allocating said effective buffer space requirement in said node for said admitted virtual circuit.

10. The method of claim 9 wherein a set of n admitted virtual circuits, having respective buffer space requirements b_n are already routed through said node and wherein the step of admitting comprises the step of:

routing an $n+1^{th}$ requested virtual circuit through said node with respective associated buffer space requirement b_{n+1} if

$$\sum_{j=1}^{n+1} b_j \leq B.$$

11. A method for processing a request from a first communications device for a virtual circuit through a network, said network having a plurality of nodes and links, each of said nodes having a plurality of output ports sharing a buffer having a buffer size, B, and each of said links being characterized by a bandwidth capacity, C, said method comprising the steps of:

provisioning a portion, B_i, of said buffer to each of said output ports, i, for use in a computation of effective bandwidth;

receiving a signal representing a request for a virtual circuit for conveying data from a communication device, the requested virtual circuit to be routed through a node connected to a link, wherein said data arrives at said node at a rate characterized by a set of parameters, said set of parameters including a long term average rate, r, a maximum burst size, B_T, and a peak rate, P;

determining said effective bandwidth and buffer space requirements from said set of parameters, wherein a ratio of said effective buffer space requirement b_0 to said allocated buffer size B_i is substantially equal to a ratio of said effective bandwidth requirement to said link bandwidth capacity C,

obtaining a lossless effective bandwidth requirement, e_0, using the expression:

$$e_0 = \frac{P}{1 + \frac{B_i}{C} \frac{(P-r)}{B_T}}; \text{ and}$$

admitting said virtual circuit request if said determined bandwidth and buffer space requirements are less than available buffer memory space in said buffer and available link bandwidth capacity in said link.

12. The method of claim 11, wherein a set of n admitted virtual circuits, having respective bandwidth requirements e_n are already routed through said node and wherein the step of admitting comprises the step of:

routing an $n+1^{th}$ requested virtual circuit through said node with respective bandwidth requirements e_{n+1} if

$$\sum_{j=1}^{n+1} e_j \leq C .$$

13. The method of claim 11, wherein said set of parameters characterize a function for controlling said rate of data from said communication device.

14. The method of claim 13, wherein said function is performed by an access regulator.

15. The method of claim 14, wherein said access regulator is a leaky bucket regulator.

16. The method of claim 11, further comprising the step of allocating said effective bandwidth requirement in said link for said admitted virtual circuit.

17. The method of claim 11, further comprising the step of allocating said effective buffer space requirement in said buffer for said admitted virtual circuit.

18. The method of claim 11, wherein a set of n admitted virtual circuits, having respective buffer requirements b_n are already routed through said node and wherein the step of admitting comprises the step of:

routing an n+1th requested virtual circuit through said node with respective buffer size requirement b_{n+1} if:

$$\sum_{j=1}^{n+1} b_j \leq B.$$

19. The method of claim 11, wherein a lossy effective bandwidth, e_l, is obtained from the expression C/K_{max}, where K_{max} is the maximum value of K that satisfies the inequality:

$$P_r\left[\sum_i^K U_i(t) \geq C\right] \leq CLR.$$

20. The method of claim 11, wherein said portion, B_i, of said buffer is allocated to each of said output ports, i, by selecting a value from a range bounded by a lower limit that divides the buffer space, B, among all the ports such that $\sum_i B_i = B_{SMF}$ and an upper limit that allocates said portion, B_i, of said buffer to each of said output ports, i, using a sharing approach where each port uses B in their computation of effective bandwidths.

21. The method of claim 11, wherein a new connection request demanding a buffer size of $b_{l_{new}}$ is admitted if:

$$\sum_j^{J_i} \sum_k^{K_{i,j}} b_{l_{i,j,k}} + b_{l_{new}}$$
$$\leq \min\left\{ C_i\left(B - \sum_i^N \sum_j^{J_i} \sum_k^{K_{i,j}} b_{l_{i,j,k}} - b_{l_{new}} \right), B_i \right\}$$

22. A network node, comprising:

at least one input port for receiving a request from a first communications device for a virtual circuit through a network, said network having a plurality of links, each of said links being characterized by a bandwidth capacity, C;

a plurality of output ports sharing a buffer having a buffer size, B;

a memory for storing computer-readable code; and

a processor operatively coupled to said memory, said processor configured to execute said computer-readable code, said computer-readable code configuring said processor to:

provision a portion, B_i, of said buffer to each of said output ports, i, for use in a computation of effective bandwidth;

receive a signal representing a request for admission of a virtual circuit in said network for conveying data from said first communications device to a second communication device, the requested virtual circuit to be routed through an access regulator and at least one node connected to a corresponding link of said network, wherein data transmission characteristics of said access regulator are represented by a set of parameters;

determine said effective bandwidth and buffer space requirements from said set of parameters, wherein a ratio of said effective buffer space requirement b_0 to said allocated buffer size B_i is substantially equal to a ratio of said effective bandwidth requirement to said link bandwidth capacity C; and

admit said virtual circuit request if said determined bandwidth and buffer space requirements are less than available buffer memory space in said buffer and available link bandwidth capacity in said link.

23. A network node, comprising:

at least one input port for receiving a request from a first communications device for a virtual circuit through a network, said network having a plurality of links, each of said links being characterized by a bandwidth capacity, C;

a plurality of output ports sharing a buffer having a buffer size, B;

a memory for storing computer-readable code; and

a processor operatively coupled to said memory, said processor configured to execute said computer-readable code, said computer-readable code configuring said processor to:

provision a portion, B_i, of said buffer to each of said output ports, i, for use in a computation of effective bandwidth;

receive a signal representing a request for a virtual circuit for conveying data from a communication device, the requested virtual circuit to be routed through a node connected to a

link, wherein said data arrives at said node at a rate characterized by a set of parameters, said set of parameters including a long term average rate, r, a maximum burst size, B_T, and a peak rate, P;

determine said effective bandwidth and buffer space requirements from said set of parameters, wherein a ratio of said effective buffer space requirement b_0 to said allocated buffer size B_i is substantially equal to a ratio of said effective bandwidth requirement to said link bandwidth capacity C,

obtain a lossless effective bandwidth requirement, e_0, using the expression:

$$e_0 = \frac{P}{1+\frac{B_i}{C}\frac{(P-r)}{B_T}}; \text{ and}$$

admit said virtual circuit request if said determined bandwidth and buffer space requirements are less than available buffer memory space in said buffer and available link bandwidth capacity in said link.